

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently amended) An indicator device, comprising:
a substrate;
a first polymeric matrix coated on the substrate; and
an indicator compound disposed within the first polymeric matrix ~~on the substrate~~, the indicator compound being colorimetrically responsive at temperatures below 0°C to volatile bases generated by food decomposition;
wherein the first polymeric matrix is formed by an acid catalyzed polymerization of a monomer material comprising a tetraalkoxysilane, an alkyl trialkoxysilane, or a mixture thereof.
2. (Original) The device of claim 1, wherein the indicator compound comprises a compound with a color transition in a range from about pH 1.0 and about pH 6.0.
3. (Original) The device of claim 2, wherein the indicator compound comprises a compound with a color transition in a range from about pH 2.5 and about pH 5.0.
4. (Original) The device of claim 1, wherein the indicator compound comprises a compound with one or more acidic functional groups in the absence of amino or alkylamino functional groups, wherein at least one of the one or more acidic functional groups is -COOH, -SO₃, -S(O₂)O-, or salts thereof.
5. (Original) The device of claim 1, wherein the indicator compound is a halogenated xanthene dye, a sulfonated azo dye, or a sulfonated hydroxy-functional triphenylmethane dye.
6. (Original) The device of claim 5, wherein the indicator compound is Bromophenol Blue, Phloxine B, Rose Bengal, Congo Red, or Metanil Yellow.

7-10. (Canceled)

11. (Original) The device of claim 1, wherein the device further comprises a second polymeric matrix covering a portion of the first polymeric matrix, wherein the second polymeric matrix is impermeable to the volatile bases generated by decomposing food.

12. (Original) The device of claim 11, wherein the second polymeric matrix covers all of the first polymeric matrix except for ~~a thin strip~~ an edge of the first polymeric matrix,
wherein color diffuses through the indicator compound disposed within the first polymeric matrix with increased exposure to the volatile bases, wherein food quality can be determined by measuring the distance of color diffusion over a predetermined time period at a particular temperature.

13. (Original) The device of claim 1, wherein the device further comprises a polymeric resin disposed within the first polymeric matrix.

14. (Original) The device of claim 1, wherein the device further comprises an acidic material disposed within the first polymeric matrix.

15. (Original) The device of claim 14, wherein the acidic material is a hydrated alumina, a zeolite, or phosphoric acid.

16. (Original) The device of claim 1, wherein the device is adapted for inclusion in a food package.

17. (Original) The device of claim 1, wherein the substrate comprises paper, plastic, cotton, flax, resin, glass, fiber glass, or fabric.

18. (Original) The device of claim 1, wherein the device consists of materials suitable for use with food.

19. (Withdrawn) A method of making an indicator device, comprising:
forming a solution of an indicator compound, a solvent, and an acid;
adding a silane monomer material to the solution;
disposing the solution on a substrate; and
polymerizing the silane monomer material on the substrate to form a silica matrix,
wherein the indicator compound is disposed within the silica matrix.
20. (Withdrawn) A method of detecting spoiled frozen food, comprising:
exposing an indicator device to frozen food, the indicator device comprising a substrate
and an indicator compound disposed on the substrate, wherein the indicator compound is
colorimetrically responsive at temperatures below 0°C to volatile bases generated by spoiled
frozen food; and
visually inspecting the device to determine if the food is spoiled by observing if the
indicator compound has changed color.
21. (Withdrawn) The method of claim 20, wherein the indicator device further comprises an
amine-impermeable polymeric matrix over the indicator compound and wherein the method
further comprises
removing a portion of the amine-impermeable polymeric matrix to expose the indicator
compound.
22. (Withdrawn) The method of claim 21, wherein the method further comprises
determining the amount of decomposition of the food by visually observing the amount
of diffusion in a color change of the indicator compound adjacent the portion of the amine-
impermeable polymeric matrix which was removed.
23. (Original) A food package for use with a food product, comprising:
packaging for a food product; and
an indicator device according to claim 1, associated with the packaging so as to be
exposed to volatile bases emitted from the food product.

24. (Original) The food package of claim 23, comprising two or more indicator devices according to claim 1, each of the indicator devices having a different amount of indicator compound or having a different amount of acid provided with the indicator compound.
25. (Original) The food package of claim 23, wherein the food product is frozen red meat, pork, poultry, processed meat products, or seafood.
26. (Withdrawn) A method for detecting the presence of an unwanted amine-producing biological agent on a food product, comprising:
 exposing an indicator device to the food product, the indicator device comprising a substrate and an indicator compound disposed on the substrate, wherein the indicator compound is colorimetrically responsive to volatile bases emitted by the unwanted amine-producing biological agent; and
 visually inspecting the device to determine if the food product contains the unwanted biological agent by observing if the indicator compound has changed color.
27. (Withdrawn) The method of claim 26, wherein the indicator device further comprises an amine-impermeable polymeric matrix over the indicator compound and wherein the method further comprises
 removing a portion of the amine-impermeable polymeric matrix to expose the indicator compound.
28. (Withdrawn) The method of claim 27, wherein the method further comprises
 determining the amount of biological agent on the food product by visually observing the amount of diffusion in a color change of the indicator compound adjacent to the portion of the amine-impermeable polymeric matrix that was removed.
29. (Withdrawn) The method of claim 26, wherein the food product is grain and the unwanted biological agent is smut.
30. (Currently amended) An indicator device, comprising:

a substrate;

a first polymeric matrix coated on the substrate; and

an indicator compound disposed within the first polymeric matrix ~~on the substrate~~, the indicator compound being colorimetrically responsive ~~response~~, without water mediation, to volatile bases generated by food decomposition;

wherein the first polymeric matrix is formed by an acid catalyzed polymerization of a monomer material comprising a tetraalkoxysilane, an alkyl trialkoxysilane, or a mixture thereof.